Federal Democratic Republic of Ethiopia

☞ EDICT OF GOVERNMENT ☜

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ET ISO 16936-1 (2005) (English): Glass in building -- Forced-entry security glazing -- Part 1: Test and classification by repetitive ball drop

ISO INSIDE

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ETHIOPIAN STANDARD

ES ISO 16936-1:2012

First edition

Glass in building — Forced-entry security glazing —

Part 1:

Test and classification by repetitive ball drop

Identical with ISO 16936-1:2005

ICS: 81.040.20

Published by Ethiopian Standards Agency

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Foreword

This Ethiopian Standard has been prepared under the direction of the Technical Committee for Ceramic, terracotta bld materials, & glass (TC 37) and published by the Ethiopian Standards Agency (ESA).

The standard is identical with ISO 16936-1:2005 Glass in building— Forced-entry security glazing—Part1: Test and classification by repetitive ball drop published by International organization for Standards (ISO).

For the purpose of this Ethiopian Standard , the adopted text shall be modified as follows.

- The phrase “International Standard” shall be read as “Ethiopian Standard”; and
- A full stop (.) shall substitute comma (,) as decimal marker.

Glass in building — Forced-entry security glazing —

Part 1:
Test and classification by repetitive ball drop

1 Scope

This part of ISO 16936 specifies requirements and a test method for security glazing designed to resist impacts of a hard body by delaying access of objects and/or persons to a protected space for a short period of time. This part of ISO 16936 classifies security-glazing products into categories of resistance to repetitive impacts of a steel sphere.

In this part of ISO 16936, the categories of resistance have not been assigned to special applications. Glazing classification should be specified on an individual basis for every application.

This part of ISO 16936 deals with mechanical resistance to impact only. Other properties can also be important.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 48:1994, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
action of force
deliberate action on the part of a person made with the intention of creating a hole in the security glazing product, by the use of manually held implements or by the use of thrown objects

3.2
asymmetric construction
product in which, from both outer surfaces, the sequence of glass panes, plastic glazing sheet material and interlayer(s) by type, thickness, finish and/or general characteristics is different

3.3
category of resistance
classification of the capability of a security-glazing product to resist actions of force

3.4
protected space
space protected against access by the completed installation

3.5

sample

specified number of test pieces which together are representative of the security glazing product intended to comply with a particular category of resistance in this part of ISO 16936

3.6

security glazing composition

specific construction of a glazing product

NOTE A product is deemed to be of the same or superior security glazing composition if individual plies are exchanged with others of a different colour, but without significant effect on the resistance to actions of force, and/or additional glazing products are installed on either face of the security glazing product, laminated to it or with an air space, and/or additional equipment such as alarm wires, heating wires, printing, or surface coatings (on part or all of the surface) are incorporated into the security glazing product, provided that this does not significantly affect the resistance to actions of force.

3.7

security glazing product

product based on glass with or without plastics with a single or multiple ply construction, where the individual plies are of uniform thickness over the whole area of the product

NOTE A security-glazing product is usually transparent or translucent, and provides a specific resistance to the actions of force.

3.8

test piece

specified piece of security glazing product submitted to a specified test procedure

4 Sampling

The sample submitted for testing shall consist of three test pieces for each category for which testing is required.

To ensure against invalid test results because of errors during the test, it is advisable to submit at least one extra test piece.

If the test pieces are of an asymmetric material, their number shall be doubled.

Each test piece shall be (1 100 ± 5) mm long × (900 ± 5) mm wide. The edges shall be free from visible chips, cracks and flaws. Glass samples should be lightly arrissed for ease of handling.

Each test piece shall be stored vertically and self-supporting at (18 ± 3) °C, for at least 12 h immediately prior to the test.

For exterior uses under extreme conditions, the influence of the outside temperature should be considered.

5 Apparatus

5.1 Impactor, consisting of a steel sphere with a diameter of (100 ± 0,2) mm and a mass of (4,11 ± 0,06) kg. The sphere shall be manufactured from polished steel with a hardness of 60 HRC to 65 HRC on the Rockwell C scale, in accordance with ISO 6508-1.

5.2 Impactor-holding equipment, with a drop height adjustable to the required tolerance (see Table 1).

The equipment for holding the impactor and the mechanism for releasing the impactor shall not induce any momentum or rotation in the impactor, so that the impactor is accelerated only by gravitational forces and falls vertically.

Table 1 — Drop heights

Category of resistance	Drop height mm
P1A	1 500 ± 50
P2A	3 000 ± 50
P3A	6 000 ± 50
P4A	9 000 ± 50
P5A	9 000 ± 50

5.3 Test piece support apparatus, consisting of a steel frame to clamp the edge of the test piece and a receiving box to collect fragments and the impactor (see Figure 1).

The support apparatus shall

- be inherently rigid;
- have an unyielding connection to a solid base;
- ensure plane and parallel clamping of the test piece in a horizontal position;
- be designed in such a way that the test piece touches only the clamping frame during the test;
- ensure clamping of the test piece on all four edges with an edge cover of (30 ± 5) mm;
- have the clamping frame covered on the contact area of the test piece with rubber strips 30 mm wide and 4 mm thick of hardness 40 IHRD to 60 IHRD, according to method N of ISO 48:1994;
- ensure that the edges of the test piece are clamped with a uniform pressure of (140 ± 20) kN/m^2;
- ensure that the impactor is not damaged and does not rebound when hitting the bottom of the receiving box;
- ensure that air cannot be trapped in the support apparatus in such a way that it may cushion the effects of the impact.

6 Required characteristics

The security-glazing product shall be submitted to testing for a particular category of resistance.

The security glazing product shall be classified in that particular category of resistance if all three test pieces (or all six test pieces in the case of an asymmetric material) prevent penetration by the impacting body when tested by the method described in Clause 7.

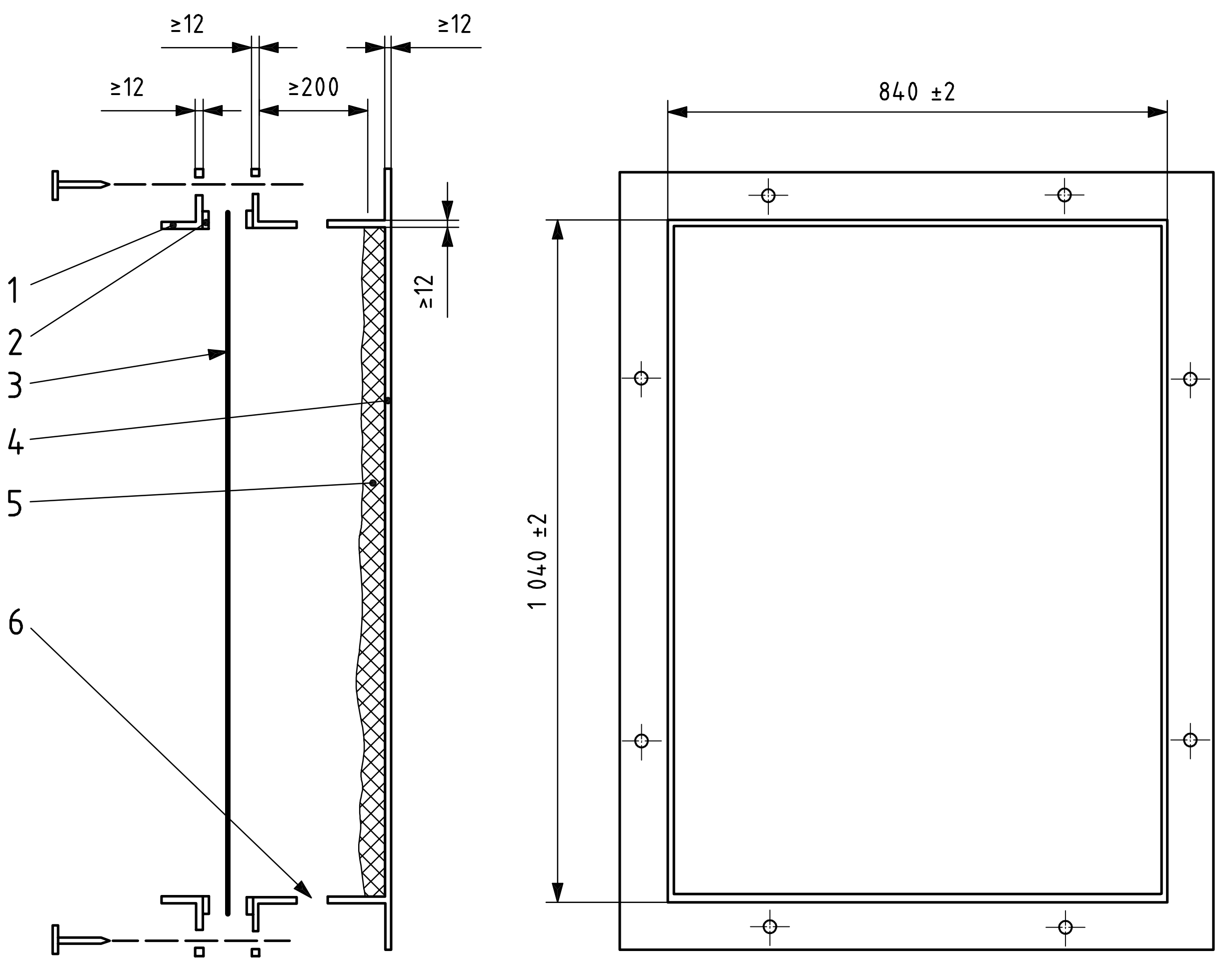
7 Test method

7.1 Room temperature test

The test room temperature shall be (18 ± 5) °C.

If the glass is tested at extreme temperatures, i.e. at −20 °C or at +40 °C, it shall be tested according to the specifications given in Annex A.

Dimensions in millimetres



Key

1	steel clamping frame
2	rubber strip
3	test piece
4	steel receiving box
5	energy absorber
6	vent holes

Figure 1 — Example of a test piece support apparatus

7.2 Installation of a test piece

The test piece shall be placed horizontally into the clamping frame of the test piece support apparatus and fixed in accordance with the requirements of 5.3.

The surface of the test piece shall be marked to indicate the location of the clamping frame relative to the test piece. This is to check for slippage of the test piece during the test.

7.3 Test procedure

The drop height (measured from the bottom of the impactor to the surface of the test piece) shall be adjusted in accordance with Table 1 for the category of resistance to be tested.

For categories P1A, P2A, P3A and P4A, the impactor shall be dropped on each test piece three times from the same height, in such a way that the impact positions form the pattern of an equilateral triangle with a side length of (130 ± 20) mm around the geometric centre of the test piece, with one side of the triangle parallel to a short side of the specimen. The impact position opposite to this side of the triangle shall be hit first.

For the category P5A, the above procedure shall be repeated a total of three times on each test piece, giving nine impacts, three on each point of the triangle.

Loose fragments shall be removed from the test piece after each impact for all levels.

For asymmetric constructions, carry out the test on both sides, i.e. the test shall be carried out first on one side and, if successful, it shall be repeated by impacting the other surface of the test piece.

7.4 Evaluation of the test results

After each impact, the test piece shall be checked for penetration by the impactor. A test piece shall be regarded as being penetrated if the impactor has completely passed through the test piece before five seconds has elapsed since the time of impact.

After each impact, the test piece shall be also examined for signs of slippage from the clamping frame. The test is invalid if any edge of the test piece has moved more than 5 mm in the clamping frame. If this is the case, then the test shall be repeated with a new test piece. If it is found to be necessary to increase the clamping pressure to prevent slippage, this shall be stated in the test report.

The clamping pressure should not exceed 200 kN/m^2. High clamping pressures can make a product unsuitable for use in insulating glass units.

8 Classification and designation

The security glazing product shall be classified in that category of resistance corresponding to the applied drop height and number of impacts, provided all test pieces have resisted penetration by the impactor.

Table 2 gives the code designations for the categories of resistance.

Table 2 — Classification table for the resistance of security glazing products

Category of resistance	Drop height mm	Total number of strikes	Code designation for category of resistance
P1A	1 500	3 in a triangle	ISO … P1A
P2A	3 000	3 in a triangle	ISO … P2A
P3A	6 000	3 in a triangle	ISO … P3A
P4A	9 000	3 in a triangle	ISO … P4A
P5A	9 000	3 × 3 in a triangle	ISO … P5A

9 Test report

The following items shall be included in the test report:

— name of the testing laboratory;

— test number;

— date of test;

— reference to this part of ISO 16936;

— name of the company or authority submitting the sample for test;

— name (trade name or descriptive name) of the security glazing product;

— description of the composition of the security glazing product;

— category of resistance that the sample was tested against in accordance with Table 1;

— code designation of the category of resistance, if obtained, in accordance with Table 2;

— test specimen conditioning temperature;

— test room temperature;

— clamping pressure, if higher than (140 ± 20) kN/m^2.

10 Marking

Products, which satisfy the requirements of this part of ISO 16936, shall be accompanied by a delivery note, which includes the code designation as given in Table 2. The same code designation can be marked on the product itself, or, for reasons of security, the code designation on the product can be omitted.

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Annex A

(informative)

Testing by repetitive ball drop at extreme temperatures

A.1 General

For products having exterior use under extreme conditions, the influence of the outside temperature should be considered. It has therefore been specified that tests should be made after the test piece has been conditioned at a specified temperature, i.e. −20 °C or +40 °C.

A.2 Test method

A.2.1 Conditioning

The test pieces should be stored vertically and self-supporting at the specified temperature, i.e. (−20 ± 3) °C or (+40 ± 3) °C, for at least 12 h immediately prior to the test.

A.2.2 Mounting of a test piece

The test piece shall be installed as described in 7.2.

A.2.3 Test procedure

Subject the test pieces to the ball drop test in accordance with the details in 7.3. Start the test within 5 min of removal from the conditioning area and each set of three impacts should take not longer than 5 min.

Bibliography

[1] EN 356, *Glass in building — Security glazing — Testing and classification of resistance against manual attack*

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Ethiopian Standards Agency

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Organization and Objectives

The Ethiopian Standards Agency (ESA) is the national standards body of Ethiopia established in 2010 based on regulation No. 193/2010.ESA is established due to the restructuring of Quality and Standards Authority of Ethiopia (QSAE) which was established in 1970.

ESA's objectives are:-

- Develop Ethiopian standards and establish a system that enable to check weather goods and services are in compliance with the required standards,
- Facilitate the country's technology transfer through the use of standards,
- Develop national standards for local products and services so as to make them competitive in the international market.

Ethiopian Standards

The Ethiopian Standards are developed by national technical committees which are composed of different stakeholders consisting of educational Institutions, research institutes, government organizations, certification, inspection, and testing organizations, regulatory bodies, consumer association etc. The requirements and/ or recommendations contained in Ethiopian Standards are consensus based that reflects the interest of the TC representatives and also of comments received from the public and other sources. Ethiopian Standards are approved by the National Standardization Council and are kept under continuous review after publication and updated regularly to take account of latest scientific and technological changes.
Orders for all Ethiopian Standards, International Standard and ASTM standards, including electronic versions, should be addressed to the Documentation and Publication Team at the Head office and Branch (Liaisons) offices. A catalogue of Ethiopian Standards is also available freely and can be accessed in from our website.

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International Involvement
ESA, representing Ethiopia, is a member of the International Organization for Standardization (ISO), and Codex Alimentarius Commission (CODEX). It also maintains close working relations with the international Electro-technical Commission (IEC) and American Society for Testing and Materials (ASTM).It is a founding member of the African Regional Organization for standardization (ARSO).

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